

Module 5 Overview

Introduction

We have seen the SVM for classification in the previous modules. In this module, we will apply the same maximum margin criterion, but for regression. First we will define regression as the estimation of a continuous variable, and then we will develop the regression strategy using SVM.

The Support Vector Machines for classification and regression are supervised. This means that they learn how to approximate a label (discrete category) or regressor (continuous number) associated to a given pattern. Thus, the training set consists of pairs of pattern-label or pattern-regressor. In many situations, there is not such label or regressor, but the only aspect that has to be analyzed is the data structure.

Sometimes, the only important aspect of the data consists of determining whether samples have a high likelihood or not. Low likelihood data are often called novelties. In this case, it is sufficient to establish a boundary between both data. This is the purpose of the SVM for novelty detection.

*"Nothing contributes so much to tranquilize the mind as a steady purpose - a point on which the soul may fix its intellectual eye."
--Frankenstein. Mary Shelley*



Mary Shelley. English writer.

Learning Objectives

By completing the theory, assignments, quizzes and discussion for this module, students will be able to:

- Explain the criterion used in SVR.
- Reproduce the dual functional for SVR.
- Analyze the properties of the support vectors in regression.
- recognize the role (as a bound) and properties of parameter ν in ν -SVR.
- set up a linear regression algorithm using Ridge regression, SVR and ν -SVR.

Required Instructional Materials

- The materials include the slides, problem statements of the assessments and the videos.

Activities

Students must read the slides, and then the quiz, plus the assessments. The first one is purely theoretical, where students need to develop the RR algorithm. In the second one, a dataset is provided to train and test an RR algorithm, while in the third and fourth, students are required to repeat the experiment with an SVR and a ν -SVR.

Supplementary materials

The original sources for this part of the course are below:

A. Smola, B. Schoelkopf, "[A Tutorial on Support Vector Regression](#)", Statistics and Computing. 14, 2004 (This tutorial fully covers the sections about SVR and ν -SVR).

D. M. J. Tax, R. P. W. Duin, "[Support Vector Data Description](#)", Machine Learning, 54, 45–66, 2004

B. Scholkopf, R. Williamson, A. Smola, J. Shawe-Taylor, J. Platt, "[Support Vector Method for Novelty Detection](#)", NIPS, 2000.

Module 5 Summary

- Theory
- Weekly Discussion
- Quizz
- Assignments 5.1 to 5.4

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